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ABSTRACT

This guide was prepared for a program designed to provide non-academic disaffected students as well as college-bound high school students with a meaningful and positive educational experience in science in order to bridge the gap between science and the citizen in a technological world. The program, designed as a full year elective course, involves the students in activities and projects that reflect concerns regarding issues in science. The major units of study in this course are matter and energy; meteorology; astronomy; atomic energy; space exploration; population growth; alternate energy sources; health hazards of drugs and smoking; and air, water, and noise pollution. Because of the interdisciplinary theme of the course of study, this program is designed to improve the entire school program by incorporating concepts and skills from other academic areas. These areas include social studies, math, industrial arts, and English. Included in this guide are: (1) purpose; (2) course description; (3) school, science program, and course goals; (4) suggested strategies for instruction and evaluation; (5) the scope and sequence of the units of study; (6) the pre-post test and answer key; (7) the student and parent evaluation sheets; and (8) evaluation guidelines. (KR)

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TOWNSHIP OF OCEAN SCHOOL DISTRICT
CONTEMPORARY SCIENCE

CURRICULUM GUIDE
SEPTEMBER, 1987

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Written By:
Ronald T. Truex

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New Jersey Governor's Teacher Grant Program - 1987
New Jersey State Department of Education

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FOREWARD

PURPOSE

"Contemporary Science" is a program designed to provide non-academic disaffected as well as college-bound high school students with a meaningful and positive educational experience in science in order to bridge the gap between science and the citizen in our technological world.

COURSE DESCRIPTION

The program, which is a full year elective course offered on a five day per week basis to all students in eleventh and twelfth grades, involves the students in activities and projects that reflect concerns regarding current issues in science. The major units of study in this course are: Matter and energy, meteorology, astronomy, atomic energy, space exploration, population growth, alternate energy sources, health hazards of drugs and smoking and air, water and noise pollution. These units have been updated by the instructor on an almost annual basis during the past 18 years to reflect the most current information and events.

This project is unique because it builds upon student experiences and previous education. Academic skills from lower grades are refined and reinforced. The multi-instructional modes of the program design are salient features of the project. Students will actively participate in laboratory experiences, independent study projects, field trips, and the presentation of oral and written reports that require extensive library research.

Because of the interdisciplinary theme of the course of study, this program is designed to improve the entire school program by incorporating concepts and skills from other academic areas. The areas include social studies, math, industrial arts and English. As a result, the program makes the school curriculum meaningful and challenging to all students.

"Contemporary Science" is a cost effective program for the district because the facilities and materials required for Biology, Chemistry and Physics courses are utilized for program activities.

TOWNSHIP OF OCEAN SCHOOL DISTRICT

SCHOOL GOALS

The Township of Ocean School District shall help each of its pupils:

1. To acquire basic skills in obtaining information, solving problems, thinking critically and communicating effectively.

2. To acquire a stock of basic information concerning the principles of the physical, biological and social sciences, the historical record of human achievements and failures, and current social issues.

3. To become an effective and responsible contributor to the decision making processes of the political and other institutions of the community, state, country and world.

4. To acquire the knowledge, skills and understanding that permit one to achieve a satisfying and responsible role as both producer and consumer.

5. To acquire the knowledge and understanding of the world of work and to acquire knowledge necessary for further education.

6. To acquire the ability to form satisfying and responsible relationships with all members of society.

7. To acquire the understanding necessary for achieving a satisfying and responsible family life.

8. To acquire the knowledge, habits and attitudes that promote the acquisition and maintenance of personal and public health, both physical and mental.

9. To express himself/herself creatively in one or more of the arts and to develop an appreciation of the aesthetic expressions of other people and the beauty in all aspects of living.

10. To acquire an understanding of ethical principles and the ability to apply them to one's own life.

11. To develop an understanding of one's own worth, abilities, potentialities and limitations.

12. To learn to enjoy the process of learning and to acquire the skills necessary for a lifetime of continuous learning and adaptation to change.

13. To appreciate and utilize leisure time wisely.

SCIENCE PROGRAM GOALS AS

RELATED TO SCHOOL GOALS

SCHOOL GOAL

To acquire basic skills in obtaining information, solving problems, thinking critically and communicating effectively.

PROGRAM GOAL

To support the entire course of general education as well as the specialized teaching of science by assisting with the development of communication and mathematical skills.

****

SCHOOL GOAL

To acquire a stock of basic information concerning the principles of the physical, biological and social sciences, the historical record of human achievements and failures, and current social issues.

PROGRAM GOAL

To familarize our students with the subject knowledge, techniques, and materials of science so that they may be able to function in a scientifically and technologically oriented society.

****

SCHOOL GOAL

To acquire the knowledge, and understanding of the world of work and to acquire knowledge necessary for future education.

PROGRAM GOAL

To familarize our students with the subject knowledge, techniques and materials of science so that they may be able to function in a scientifically and technologically oriented society.

****

SCHOOL GOAL

To acquire the knowledge, habits and attitudes that promote the acquisition and maintenance of personal and public health, both physical and mental.

PROGRAM GOAL

To stimulate the intellectual curiosity of our students through the use of the scientific method while doing laboratory experiments. Through this pedagogical method students learn both the skills and equipment employed in science, learn the necessity of good safety habits, and acquire techniques and procedures that can be applied to new and varied situations.

****

COURSE GOALS

As a result of the integrating of numerous aspects of the natural and physical sciences as they relate to a student's understanding of the world around him, the following outcomes are expected from participants in the "Contemporary Science" program:

1. Student scientific curiosity and interest will be stimulated.

2. Students will be provided with access to information that enables them to make intelligent judgements about issues in science such as nuclear energy, pollution, population problems and health.

3. Students can relate science and technology to everyday living.

4. Students will develop positive attitudes toward science.

5. Students will be provided with activities that reinforce basic skills, such as library research, mathematics and oral/written communication.

6. Students will understand the relationship of science to social issues.

7. Students will develop an understanding of the numerous career opportunities in science, health and technology.

8. Students will engage in independent study in order to allow them to pursue their own interests and concerns while addressing individual differences in learning styles.

STRATEGIES FOR LEARNING STYLES

Instructional techniques should attempt to address a variety of learning styles. Since different students within a class may learn in different ways, the method of teaching should meet the diversity of learning styles. Variety of presentation of a lesson can accomodate different learning styles.

To accomodate those students who process information in an auditory mode, the instructional technique should include the use of records, tapes, and extensive verbal interaction. Here, questioning techniques and a continuous dialogue between student and teacher is most appropriate.

The visual mode is an obvious mechanism for the learning expericence. Films, video cassettes, transparencies, slides, filmstrips, and pictures are significant components of a lesson presented in the visual mode. Students that employ the visual mode as the primary learning style find the textbook to be an important learning tool. Likewise extensive use of the chalkboard can help students that rely on the processing of visual data.

In addition, the kinesthetic mode provides students with an alternative learning route. Because of the hands-on nature of laboratory work in science courses, this learning style can be easily addressed. The kinesthetic mode guides learning through the use of manipulative experiences. Such students learn more effectively when they can touch, feel, construct, dissect, organize, and measure during a learning experience.

As a result, learning can be most efficient and teaching can be most effective when learning styles are considered in the design of a lesson. Attention to the visual, auditory, and kinesthetic modes can serve only to make learning a more positive and enjoyable experience.

SUGGESTED METHOD OF INSTRUCTION

It is recommended that the following variety of approaches be utilized in the presentation of the Contemporary Science Program.

1. Require students to keep a complete and updated notebook throughout the course.

2. Utilization of varied worksheets and study guides as appropriate for unit being studied.

3. Extensive use of variable types of visual-aids including: films, videotapes, filmstrips, charts, transparancies, and diagrams.

4. Encourage the use of newspapers, magazines, books, T.V. science programs to obtain updated scientific information.

5. Utilize oral reports, group projects, student demonstrations and class discussions.

6. Incorporate community resources whenever possible.

7. Emphasize the interdisciplinary nature of science with other school programs.

8. Schedule field trips where appropriate.

SUGGESTED METHODS OF EVALUATION

1. **QUIZZES** - Periodic quizzes provide feedback for both teacher and student regarding the level of understanding. These evaluations can be short answer or multiple choice that stress mastery of basic concepts.

2. **TESTS** - Major unit tests should be administered at the conclusion of a unit. These tests should be of the short answer, essay or multiple choice variety. Emphasis should be on concepts rather than rote memory. Tests should be designed to develop higher order thinking skills such as analysis and evaluation. Open notebook tests encourage students to take accurate notes and to apply concepts and information.

3. **INDEPENDENT RESEARCH REPORTS** - A major course requirement will be the use of library research skills for the completion of scientific research each marking period. These reports are included in activities that are components of individual units.

4. **ORAL REPORTS** - The presentation of library research reports enhances the development of communication skills. This technique allows students to share information about topics of scientific interest.

5. **NOTEBOOK** - Notetaking is a vital part of the program since a variety of instructional resources are utilized in the absence of a formal text. Accuracy and organization of notebooks will be utilized as a measure of evaluation.

6. **ATTENDANCE** - Since the program does not have a book it is vital that the student be present in order to keep abreast of the new information presented daily. When a student is absent, grade deductions will be made. The student can make these deductions up by completing a short written report on a current science event from a newspaper or magazine.

SCOPE AND SEQUENCE

I. Introduction to Contemporary Science
   - A. Definition of science as a way of problem solving
   - B. Steps of the scientific method
   - C. Library research skills
   - D. Fields of science
   - E. Definition of technology

II. Population
   - A. Characteristics of populations
   - B. Growth rates of human populations
   - C. Population changes
   - D. Consequences of overpopulation
   - E. Human population control

III. The Intoxicants of Humans
   - A. Tobacco
   - B. Drugs
   - C. Alcohol

IV. Nuclear Energy
   - A. Structure of matter
   - B. Nuclear reactions
   - C. Detection of radiation
   - D. Effects of nuclear radiation
   - E. Energy from nuclear explosions

V. Astronomy
   - A. The universe
   - B. The solar system

VI. Space
   - A. The challenage of space travel
   - B. Manned space programs
   - C. Unmanned space programs
   - D. Benefits of the space program
   - E. Unidentified flying objects

VII. Human Behavior
   - A. Nervous system
   - B. Reflexes
   - C. Learning
   - D. Sleep

VIII. Air Pollution
   - A. The Earth's atmosphere
   - B. Natural pollutants
   - C. Man made pollutants
   - D. Cycles of atmospheric gases
   - E. Examples of atmospheric pollutants
   - F. The effects of air pollution
   - G. Control of air pollutants

IX. Water Pollution
  A. The Earth's hydrosphere
  B. Water contaminents
  C. Effects of water pollution
  D. Control of water pollution
  E. Acid rain

X. Noise Pollution
  A. The science of sound
  B. Effects of noise pollution
  C. Sound control

XI. Energy Resources
  A. Energy demand
  B. Energy sources
  C. Energy consumption
  D. Production of electric power

XII. Meteorology
  A. Composition of the atmosphere
  B. Weather

UNIT TITLE: INTRODUCTION TO CONTEMPORARY SCIENCE (I)

BACKGROUND INFORMATION:

The application of science to contemporary problems can act as a tool to motivate students and to enhance interest in this area. This introductory unit provides the students with a definition of science and a broad understanding of the scientific method. After a review of library research methods, the students conduct literary research on a particular branch of science. The students then present their information to the class in the form of an oral report. This initial activity is designed to expose students to the importance of information access and retrieval. The tone of the instructional program is set with the unifying theme of encouraging the development of scientific thinking with an appreciation for the application of science to personal and societal problems. This introductory unit also serves to enhance the student's awareness of career opportunities in science.

OBJECTIVES

Students should be able to:

1- Define science.

2- Compare the physical and natural sciences.

3- Apply the steps of the scientific method.

4- Employ a variety of library research skills. .

5- List and define numerous branches of science.

6- Relate the contributions of the natural and physical sciences to society.

7- Describe the application of science to technology.

8- Identify careers related to science and technology.

CONTENT OUTLINE

I. Definition of Science as a Way of Solving Problems
    A. Physical sciences
    B. Natural sciences

II. Steps of the Scientific Method
    A. Recognize a problem
    B. Formulate a hypothesis
    C. Design a controlled experiment to test hypothesis
    D. Collect data
    E. Formulate conclusion

III. Library Research Skills
    A. Use of card catalogue
    B. Use of reader's guide
    C. Use of vertical file
    D. Use of encyclopedia
    E. Use of reference books
    F. Checkout procedures for library materials
    G. Appropriate library behavior
    H. Use of microfilm

IV. Fields of Science
    A. Physical science
        1. Astronomy
        2. Meteorology
        3. Chemistry
            a. organic
            b. inorganic
        4. Geology
        5. Cryogenics
        6. Space engineering
        7. Atomic physics
        8. Electronics
        9. Mechanics
    B. Natural science
        1. Genetic engineering
        2. Mendelian genetics
        3. Botany
        4. Zoology
            a. Vertebrate zoology
            b. Invertebrate zoology
        5. Oceanography
        6. Ecology
        7. Physiology
        8. Microbiology
        9. Paleontology
        10. Exo-biology
        11. Psychology

a. Human
b. Animal

V. Definition of Technology
A. Examples of technology
B. Application of technology

ACTIVITIES

1- Students write a paragraph that describes the term "science" from their perspective.

2- Students list applications of science in everyday life.

3- Students cite examples of the application of the scientific method to solve problems.

4- School librarian provides students with an introduction to library skills.

5- Given a list of science areas, students prepare a written report on one branch of science while using library research skills.

6- Using a variety of visual aids, students present oral reports on selected fields of science.

7- Given a list of careers in science, students write an essay about one area of interest.

8- Using the classified section of a newspaper, students collect ads related to job opportunities in science.

AUDIO-VISUAL AIDS

FILMS

1. You in the Universe
   Educational Images Ltd.,
   West Side, Elmira, New York. 14905
   (filmstrip or videocassette)

2. Frontiers of Technology
   National Geographic Society,
   P.O. Box 1640,
   Washington, D.C. 20013-9861
   (filmstrips with cassettes)

3. Technological Man
   Wards Natural Science Establishment, Inc.,
   5100 West Henrietta Road
   P.O. Box 92912,
   Rochester, New York.
   (Videocassette)

4. Scientists and How They Work
   National Geographic Society,
   Educational Services, Dept. 87,
   Washington, D.C. 20036
   (filmstrips with cassettes, #04347)

REFERENCES

1. Considine, D.M. and Considine, G.D., ed.
   Von Nostrand's Scientific Encyclopedia.
   vol. II, New York: Von Nostrand-Reinhold Co., 1983.

2. Mitchell, Joyce S. I Can be Anything - A Career Book for Women. New York: College Board Publications, 1982.

3. Parker, S.P., ed., McGraw-Hill Yearbook of Science and Technology. New York: McGraw-Hill, 1985.

UNIT TITLE: POPULATION (II)

BACKGROUND INFORMATION:

The understanding of the principles of population growth provide perspective on the causes of societal and environmental problems. As a contemporary issue in science, this topic of study helps students to recognize that human populations cannot continue to expand indefinitely. As a result, students are confronted with issues that encourage debate, including population control, immigration restrictions, and the development of third world countries. This unit provides the biological information needed to understand population dynamics. Such an understanding will enable students to argue and judge the need for regulation of human population growth. It should be noted that this topic establishes the need for a more detailed study of pollution and energy resources that are included in the course of study.

OBJECTIVES

Students should be able to:

1- Define and describe population properties.

2- Compare and contrast growth patterns.

3- Relate population determiners to fluctuations in growth patterns.

4- Interpret population growth curves.

5- Describe the factors which limit population growth.

6- Distinguish between dynamic equilibrium and population explosion.

7- Determine the doubling time of a population.

8- Relate carrying capacity to population growth trends.

9- Compare theories of human population growth.

10- Identify and describe the pressures placed on ecosystems by overpopulation.

11- Debate the societal effects of overpopulation.

CONTENT OUTLINE

I. Characteristics of Populations
    A. Definition
        1. Limits of time
        2. Limits of space
    B. Properties
        1. Growth patterns
        2. Carrying capacity
        3. Mortality patterns
        4. Age structure

II. Growth Rates for Human Populations
    A. Growth patterns for the world
    B. Growth patterns for technologically advanced countries
        1. United States
        2. England
        3. Japan
    C. Growth patterns for underdeveloped countries
        1. Africa
        2. Central America
        3. South America

III. Population Changes
    A. Determiners of a population
        1. Natality
        2. Mortality
        3. Immigration
        4. Emigration
    B. Limiting factors of a population
        1. Predation
        2. Intraspecific competition
        3. Disease
            a. Bubonic plague
            b. Cancer
            c. AIDS
        4. Starvation
        5. Environmental conditions
    C. Types of growth
        1. Dynamic equilibrium
            a. Open populations
            b. Closed populations
        2. Population explosion
            a. Malthusian principle
            b. Geometric growth rate

IV. Consequences of Overpopulation
    A. Exhaustion of natural resources
    B. Effects on the environment
        1. Air pollution

2. Water pollution
3. Noise pollution

C. Disturbance of the balance of nature

D. Effects on society
1. Human behavior
2. Political organization
3. Economic Stability

V. Human Population Control

A. Family planning
1. Genetic engineering
2. Sterilization
3. Abortion

B. Education

C. Legislation
1. Tax incentives
2. Marital age
3. Limitation of family size

ACTIVITIES

1- Students collect and graph growth of technologcally advanced and underdeveloped countries.

2- Students predict future population projections.

3- Students present group reports on effect of limiting factors on population growth.

4- Students diagram populations demonstrating dynamic equilibrium and explosion.

5- Students write reports on theories of Thomas Malthus, Karl Marx, Paul Erlich.

6- Students write reports on local population growth.

7- Students write research reports on methods of population control.

8- Students debate on whether or not society has a right to tell individuals how many children they can have.

9- Students meet in groups and formulate opinions on social effects of population growth if the size of their school population doubled while the building and classroom sizes remained the same.

10- Students write research reports on the societal and environmental effects of overpopulation.

AUDIO-VISUAL AIDS

FILMS

1. "Genetic Engineering - The Nature of Change"
   Modern Talking Picture Service,
   P.O. Box 950
   71 N. Passaic Avenue
   Chatham, N.J. 07928 #17375

2. "The Science of Genetics: Feeding a Growing World"
   Modern Talking Picture Service

FILMSTRIPS

1. "Extinction and Endangered Species: Natural Process on Human Intervention?"
   Science and Mankind, Inc.,
   Communications Park, Box 2000,
   Mount Kisco, N.Y. 10549 #2-1064-610

2. "The Ethics of Genetic Control"
   Science and Mankind, Inc.,
   Communications Park, Box 2000,
   Mount Kisco, N.Y. 10549 #1-1011-610

3. "The New Genetics: Rights and Responsibilities"
   Science and Mankind, Inc.,
   Communications Park, Box 2000,
   Mount Kisco, N.Y. 10549 #1-1002-610

4. "Population Dynamics"
   Wards,
   5100 West Henrietta Road,
   P.O. Box 92912
   Rochester, N.Y. 14692-9012 #78W0510

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1. Morgan, J.M., Morgan, M.D., and J. H. Wiersma. Introduction to Environmental Science. San Francisco: W.H. Freeman, 1980.

2. Southwick, C.H. Global Ecology. Sunderland, MA: Sinauer Assoc., 1985.

3. Stwertka, E. and A. Stwertka. Population Growth Change and Impact. New York: Impact Books, 1981.

4. Tapinos, G. and P.T. Piotrow. Six Billion People. New York: McGraw-Hill, 1978.

5. Volpe, E.P. Biology and Human Concerns. Dubuque, IA: Willliam C. Brown Company, 1984.

6. Wallace, R.A., J.L. King, and G.P. Sanders. Biosphere: The Realm of Life. Glenview, IL.: Scott Foresman, 1984.

RESOURCES

1. Population Reference Bureau
   1755 Massachusettes Avenue,
   Washington, D.C. 20036

2. Social Issues Resources Series, Inc.
   P.O. Box 2507
   Boca Raton, Florida 33427

3. The Environmental Fund
   1302 Eighteen Street, N.W.
   Washington, D.C. 20036

4. National Right to Life Education Foundation
   529 14th Street, N.W.
   Washington, D.C. 20045

UNIT TITLE: THE INTOXICANTS OF HUMANS (III)

BACKGROUND INFORMATION:

The problem of substance abuse by young people can scarcely be understood when separated from its context, which is the whole life of the young person. It is important to see how the present and the future look to them, and to understand how well the present prepares them for the future.

This unit on health education attempts to develop an understanding of the medical and scientific aspects of alcohol, drug and tobacco abuse as well as the social and emotional consequences. The students are provided with a knowledge of the chemical components and the physical and mental effects of each substance through films, filmstrips, videos, and guest speakers.

It is hoped that an examination of this applied science will provide the student with an understanding that alcohol, drug, and tobacco involvement can have lifelong detrimental effects upon success in school, on the job, as part of a family and most important to his own health and happiness.

OBJECTIVES

Students should be able to:

1- List five forms of tobacco.

2- Identify the body systems affected by tobacco.

3- Name the harmful ingredients in tobacco.

4- Identify diseases which are linked to long-term tobacco use.

5- Analyze reasons why people are motivated to use tobacco.

6- Relate the benefits on not using tobacco.

7- Differentiate between over-the-counter, prescription, and illegal drugs.

8- Classify and characterize the major groups of drugs.

9- Analyze the statement, "All medicines are drugs, not all drugs are medicines."

10- Describe the physical and psychological effects of drug abuse.

11- Analyze reasons why people are motivated to use drugs.

12- Identify and characterize the types of alcoholic beverages.

13- Describe the effect of alcohol on physical and mental condition.

14- Relate the factors which effect an individual's reaction to alcohol.

15- Identify the difference between problem drinking and an alcoholic.

16- Analyze reasons why people are motivated to use alcohol.

CONTENT OUTLINE

I. Tobacco
   A. Forms of tobacco
      1. Cigarettes
      2. Pipe
      3. Chewing
      4. Snuff
      5. Cigar
   B. Body systems affected
      1. Respiratory system
      2. Circulatory system
   C. Harmful ingredients of tobacco
      1. Nicotine
      2. Tar
      3. Carbon monoxide
   D. Medical dangers of tobacco
      1. Lung cancer
      2. Emphysema
      3. Bronchitis
      4. Coronary disease
      5. Addiction (mental and physical)
      6. Other cancers
   E. Personal decisions about tobacco
      1. Reasons for using tobacco
      2. Benefits of not using tobacco
      3. Methods to stop tobacco use

II. Drugs
   A. Classification and characteristics of drugs
      1. Narcotics
      2. Depressants
      3. Stimulants
      4. Hallucinogens
   B. Medical dangers of drugs
      1. Physical dependence
      2. Psychological dependence
      3. Biological effects of overdose
      4. Withdrawal syndrome
   C. Personal decisions about drugs
      1. Reasons why people use drugs
      2. Problems created by abuse of drugs
      3. Treatment for drug abuser

III. Alcohol
   A. Types of alcoholic beverages
      1. Beer
      2. Wine
      3. Hard Liquor
      4. Cordials and liquers

B. Medical dangers of alcohol
   1. Physical dependence
   2. Psychological dependence
   3. Damage to brain, kidneys, liver
   4. Damage to heart and blood vessels
   5. Vision and hearing impairment

C. Factors which effect individual reaction to alcohol
   1. Rate of absorption
   2. Rate of consumption
   3. Type of beverage
   4. Physical factors
   5. Motivation
   6. Experience

D. Personal decisions about alcohol
   1. Reasons why people use alcohol
   2. Problems created by alcohol abuse
   3. Treatment for alcoholism

ACTIVITIES

1- Use a smoking machine to demonstrate the collection of tar in the lungs because of cigarette smoking.

2- Test the effects of smoking on student's pulse, temperature and blood pressure.

3- Use transparency, filmstrip or film to examine parts of respiratory and circulatory systems.

4- Students write two-page research report on the effect of smoking on health.

5- Calculate the cost of cigarettes.

6- Conduct a survey of sources of advertisements for tobacco products.

7- Survey adults about their attitudes toward smoking.

8- List and chart the four drug classifications, stating examples of each.

9- Discuss reasons why people start to use drugs.

10- Students write reports on the history, examples of, and effects of one of the major drug groups.

11- Compare and contrast the social, economic and biological concerns of drug abuse.

12- Debate pro's and con's of legalization of marijuana.

13- Calculate alcohol content of 100 proof whiskey, wine, beer.

14- Discuss the reasons why people drink.

15- Arrange for guest speakers from A.A. to discuss their problems with alcohol.

16- Arrange for guest speaker from local police department to discuss the drinking and driving laws in New Jersey.

17- Student group reports on effects of alcohol: (a) on personality; (b) in sports; (c) in driving a car; (d) in occupational skills.

AUDIO-VISUAL AIDS

FILMS

1. Decision Alcohol
   Q-Ed Productions,
   2282 Townsgate Road,
   P.O. Box 4029,
   Westlake Village, CA 91359

2. A Family Talks About Alcohol
   Perennial Education Inc.,
   Highland Park, Illinois

3. Dial Alcohol series (videocassettes)
   New Jersey Network,
   Trenton, N.J.

4. Alcohol, Narcotic and Drug Abuse (videotapes)
   N.J. Department of Health, Alcohol, Narcotic and
   Drug Abuse Training and Education Center,
   1230 White Horse-Mercerville Road,
   Trenton, N.J. 08619

5. Decision for Mike
   American Cancer Society

6. From One Cell
   American Cancer Society

7. Who's in Charge Here
   American Cancer Society

REFERENCES

1. Brody, Jane E. Jane Brody's The New York Times
   Guide to Personal Health. Times Books, 1982.

2. U.S. Department of Health and Human Services,
   Public Health Service,
   Office on Smoking and Health.
   The Health Consequences of Smoking for Women.
   Washington, D.C.,
   U.S. Government Printing Office, 1980.

3. Whaley, Russell F. Health. Prentice Hall, 1982.

RESOURCES

1. ACTION'S Initiative on Drug Use Prevention Among Youth
   806 Connecticut Ave., N.W.,
   Washington, D.C. 20525

2. National Clearinghouse on Alcohol Information
   P.O. Box 2345,
   Rockville, MD. 20852

3. National Clearinghouse on Drug Abuse Information
   P.O. Box 416,
   Kensington, MD. 20795

4. National Committee for the Prevention of Alcoholism
   and Drug Dependency
   6830 Laurel St.,
   Washington, D.C. 20012-2199

5. New Jersey Vocational Education Resource Center (NJVERC)
   Crestway,
   Aberdeen, N.J. 07747

UNIT TITLE: NUCLEAR ENERGY (IV)

BACKGROUND INFORMATION:

Nuclear energy is a topic that sparks the interest and enthusiasm of students. While describing the structure of the atom, this unit attempts to provide an understanding of the science of nuclear energy. This topic should provide youngsters with the information and resources to assess our responsibility in a nuclear age while they investigate the science of atomic energy. Using various activities, the students gain a conceptual understanding of the effects of nuclear weapons and the problems of survival in a nuclear war. While discussing civil defense strategies for a nuclear attack, students also are exposed to civil defense strategies for survival during natural disasters.

OBJECTIVES

Students should be able to:

1- Diagram and label the parts of the atom.

2- List and describe the forms of radiation.

3- Define and diagram a fusion reaction.

4- Define and diagram a fission reaction.

5- Trace the historical development of the atomic theory.

6- Demonstrate the use of radiation detection instruments.

7- State the units of radiation measurement.

8- Plot the course of nuclear decay.

9- Describe the effects of radioactive fallout.

10- Predict the consequences of nuclear winter.

11- Compare conventional to atomic weapons.

12- Construct a map depicting the effects of a nuclear explosion.

13- Describe the purpose and organization of civil defense programs.

CONTENT OUTLINE

I. Structure of Matter
    A. States of matter
    B. Elements and compounds
    C. Atomic structure
        1. The nucleus
        2. The energy levels
    D. History of the atomic theory
        1. John Dalton
        2. Ernest Rutherford
        3. Neils Bohr
        4. Enrico Fermi
        5. J.R. Oppenheimer

II. Nuclear Reactions
    A. Fission
    B. Fusion
    C. Types of radiation
        1. Alpha rays
        2. Beta rays
        3. Gamma rays

III. Detection of Radiation
    A. Instrumentation
        1. Geiger counter
        2. Scintillation counter
        3. Dosimeter
    B. Units of measurement
        1. Rem
        2. Rad
        3. Roentgen
    C. Nuclear Decay

IV. Effects of Nuclear Radiation
    A. Radioactive fallout
        1. Medical effects
        2. Environmental effects
    B. Nuclear winter

V. Energy From Nuclear Explosions
    A. Types of nuclear weapons
        1. Atomic weapons
        2. Hydrogen bomb
        3. Neutron bomb
    B. Civil defense
        1. Protection, survival of nuclear attack
        2. Protection, survival of natural disaster
            a. Tornadoes
            b. Blizzards
            c. Hurricanes

ACTIVITIES

1- Students present oral/written reports on history of the atom.

2- Using various references, students construct diagrams of fission and fusion reaction.

3- Use of dosimeter, geiger counter and scintillation counter is demonstrated by the teacher.

4- Conduct class activity on calculation of half-life of radioactive elements.

5- Class discussion of articles relating to the effects of nuclear war.

6- Students construct zones of destruction from nuclear weapons on state or national maps.

7- Comparison of various size nuclear weapons.

8- Conduct class activity on calculation of distance and time factors as a means of protection from radiation.

9- Discuss chart on symptons of radiation sickness.

10- Students solve simulated shelter problems.

11- Students debate on the need for and use of nuclear weapons.

12- Guest speaker from local, county, state civil defense organizations.

13- Conduct survival case study for natural disaster.

AUDIO-VISUAL AIDS

FILMS

1. War Without Winners
   Films Incorporated,
   733 Green Bay Rd.,
   Wilmette, Illinois. 60091

2. There's a Nuclear War Going on Inside Me
   Educators for Social Responsibility,
   23 Garden Street,
   Cambridge, Massachusettes. 02138

FILMSTRIPS

1. The Atom Bomb
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

2. Hiroshima
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

3. Nuclear Physics Series
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

REFERENCES

1. Teaching About Energy, vol. 3 (The Energy 80's Resource Book). Santa Monica, California: Enterprise for Education, 1985.

2. Newton, David E. Knowledge for a Nuclear War. Portland, Maine: J. Weston Walch, 1987.

3. Thacher, S.M. and Orzack, S.H. 1983. The Consequences of Nuclear War. Carolina Tips 46:12, 45-46.

4. Turco, R.P., Toon, O.B., Ackerman, T.P., Pollack, J.B., and Sagan, C. 1984. The Climatic Effects of Nuclear War. Scientific American 251:2, 33-43.

5. Walter, Charles A., et.al. Too Hot to Handle? New Haven: Yale University Press, 1983.

RESOURCES

1. American Nuclear Society
   555 North Kensington Avenue,
   La Grange Park, Illinois. 60525

2. Atomic Industrial Forum
   7101 Wisconsin Avenue,
   Washington, D.C. 20014

3. The American Museum of Atomic Energy
   Oak Ridge Associated Universities,
   P.O. Box 117,
   Oak Ridge, Tennessee. 27830

4. U.S. Department of Energy
   Education Division,
   Office of Consumer Affairs,
   Washington, D.C. 20585

UNIT TITLE: ASTRONOMY (V)

BACKGROUND INFORMATION

The study of astronomy provides students with an understanding of the Earth in relationship to the universe. The fragile atmosphere and environment of our planet becomes obvious when compared to the other heavenly bodies. This unit provides a classical approach to the study of the origin and composition of the universe and our solar system. Many students may have been exposed to this information in previous courses. As a result, the teacher is provided with a rich resource of experiences upon which lessons can be constructed. This area of study is intended to provide the students with a background that will enrich the investigation of the following unit on space exploration.

OBJECTIVES

Students should be able to:

1- State three theories of the origin of the universe.

2- Describe the types of galaxies.

3- Trace the life history of a star.

4- Recognize and identify seasonal constellations.

5- Differentiate between blackholes, quasars, and pulsars.

6- Compare theories of the origin of the solar system.

7- Catagorize planets by location.

8- Compare planetary characteristics to those of Earth.

9- Explain the role of the sun in maintaining planetary orbits.

10- Compare the features of moons, asteroids, comets, and meteors.

CONTENT OUTLINE

I. The Universe
    A. Origin of the universe
        1. The expanding universe
        2. Steady state cosmology
        3. Expansion contraction
    B. Composition of the universe
        1. Galaxies
            a. Definition
            b. types
        2. Stars
            a. Definition
            b. Life of a star
            c. Composition
            d. Size - super giants to dwarfs
            e. Constellations
                (1) seasonal star patterns
                (2) observation of constellations
            f. black holes
            g. quasars
            h. pulsars

II. The Solar System
    A. Origins of the solar system
        1. Planetesimal Theory (Comte de Buffon
        2. Companion Star Theory (Hoyle)
        3. Cloud of Dust (LaPlace)
    B. Composition of the solar system
        1. Planets
            a. Location in solar system
            b. Size and Composition
            c. Comparison to Earth's characteristics
        2. Sun
            a. Size and Composition
            b. Energy output
        3. Moons
        4. Asteroids
        5. Comets
        6. Meteors

ACTIVITIES

1- Students name and diagram types of galaxies.

2- Students observe and identify constellations of northern hemisphere using star maps.

3- Students write reports on black holes, quasars, pulsars, and nova.

4- Students construct diagram of solar system and name planets in their order from sun.

5- Students identify zones of sun.

6- Students construct diagrams of solar and lunar eclipses.

7- Student reports on asteroids, comets, meteors, moons.

8- Using library resources students can report on famous astronomers such as Kepler, Galileo, Copernicus.

9- Field trip to a planetarium.

10- Students write summerization reports on various segments of cosmos.

AUDIO-VISUAL AIDS

FILMS

1. The Lives of the Stars
   (program 9)
   Films Incorporated,
   1144 Wilmette Avenue,
   Wilmette, Illinois 60091

2. Shores of the Cosmic Ocean
   (program 1)
   Films Incorporated,
   1144 Wilmette Avenue,
   Wilmette, Illinois 60091

3. Heaven and Hell
   (program 4)
   Films Incorporated,
   1144 Wilmette Avenue,
   Wilmette, Illinois 60091

4. See NASA in Resource section.

FILMSTRIPS

1. The Planets
   Educational Images Ltd.,
   Elmira, N.Y. 14905 (SS030SF)

2. Mars, Jupiter and Saturn
   Educational Images Ltd.,
   Elmira, N.Y. 14905 (SS1110F)

3. Voyager in Space
   Educational Images Ltd.,
   Elmira, N.Y. 14905 (EP2087)

4. Astronomical Wonders
   Educational Images Ltd.,
   Elmira, N.Y. 14905 (set #337)

REFERENCES

1. Doherty, Paul. Atlas of the Planets. New York: McGraw-Hill, 1980.

2. Kippenhahn, Rudolf. 100 Billion Suns. New York: Basic Books, 1983.

3. Moore, Patrick. The New Atlas of the Universe. New York: Random House, 1985.

4. Sagan, Carl. Comet. New York: Random House, 1985.

5. Sagan, Carl. Cosmos. New York: Random House, 1980.

6. Washburn, Mark. Distant Encounters. New York: Harcourt Brace Jovanovich, 1983.

RESOURCES

1. National Aeronautics and Space Administration
   NASA Facts. John F. Kennedy Space Center
   Florida 32899

2. NASA - Goddard Space Flight Center
   Attn: Teacher Resource Laboratory
   Mail Stop 130-3, Greenbelt, MD 20771

UNIT TITLE: SPACE EXPLORATION (VI)

BACKGROUND INFORMATION

The history and development of the United States Space Program reveals both the accomplishments and limitations of science and technology. Early space programs like Mercury and Gemini provide students with an insight into the process of solving the technological problems of space exploration. The Apollo program reflects one of the greatest accomplishments of humankind in the form of the lunar landing. In addition to a study of the manned space programs, this unit also investigates the valuable information obtained from unmanned programs like Explorer. The present initiatives of the space program are put in perspective by a review of the Space Shuttle Program. The Challenger disaster of January, 1986, can be employed to initiate a debate on the risks of space travel. The role of space exploration in advancing technology is emphasized. Again, students have the opportunity to evaluate the benefits of space technology in terms of such governmental programs as the "Star Wars" defense plan.

OBJECTIVES

Students should be able to:

1- Describe the physical conditions of space.

2- Compare types of launch vehicles.

3- Draw three types of Earth orbits.

4- Explain the problems of living in space.

5- Trace the history of the U.S. Space Program.

6- Relate the role of the Mercury, Gemini, and Apollo missions to the goals of the U.S. Space Program.

7- Assess the risks and benefits of space exploration.

8- Appraise information related to unidentified flying objects.

9- Defend an opinion about future space exploration.

CONTENT OUTLINE

I. The Challenge of Space Travel
    A. Conditions in space
        1. The edge of space
        2. Interplanetary space
        3. Interstellar space
    B. Getting to space
        1. Forces to overcome
            a. Gravity
            b. Friction
        2. Types of launch vehicles
            a. Building block boosters
            b. Piggyback boosters
            c. Space shuttle systems
        3. Types of Earth orbits
            a. Inclined orbit
            b. Polar orbit
            c. Synchronous orbit
    C. Living in Space
        1. Life support systems
        2. Communications
        3. Navigation
        4. Medical needs

II. Manned Space Programs
    A. Early programs
        1. Mercury
        2. Gemini
        3. Apollo
        4. Skylab
    B. Space shuttle program
        1. Design
        2. Purpose
        3. Effect of Challenger disaster
        4. Program accomplishments

III. Unmanned Space Programs
    A. Space probes
        1. Explorer
        2. Mariner
        3. Viking
        4. Voyager
    B. Artificial satellites
        1. Weather satellites
        2. Communications satellites
        3. Navigation satellites
        4. Scientific satellites
        5. Military satellites
        6. Geophysical

IV. Benefits of the Space Program
   A. Communications
   B. Weather
   C. Navigation
   D. Agriculture
   E. Astronomy
   F. Oceanography
   G. Technology
   H. Medicine
   I. Defense

V. Unidentified Flying Objects
   A. Sightings
   B. Proposed explanations
   C. Scientific validity of sightings and explanations

ACTIVITIES

1- Students list the ways gravity influences everyday activities.

2- Students identify and write names of launch vehicles on diagram.

3- Students graph and plot satellite orbits.

4- Students list problems astronauts may encounter while in space.

5- Students write research reports on U.S. space programs.

6- Students label chart showing steps in space shuttle flight.

7- Students write reports on accomplishments and contributions of Space Shuttle Program.

8- Students write reports on discoveries of unmanned space probes.

9- Students identify and describe uses of artificial satellites.

10- Students write research reports on contributions of U.S. Space Program.

11- Students construct and photograph homemade UFO's to demonstrate how hoaxes are created.

AUDIO-VISUAL AIDS

FILMS

1. "Encyclopedia Galactica", (program 12)
   COSMOS,
   Films Incorporated,
   1144 Wilmette Ave.,
   Wilmette, Illinois 60091

2. "Life in the Cosmos"
   National Geographic Educational Services,
   Dept. 87
   Washington, D.C. 20036 #04788

3. NASA Films
   See Resource #1.

4. "Reaching Into Space: The Story of Flight."
   National Geographic Educational Services,
   Dept. 87
   Washington, D.C. 20036 #04215

REFERENCES

1. Furniss, Tim. Manned Space Flight Log. Jane's, 1983.

2. Greg, Jerry. Beachheads in Space. New York: McMillan, 1983.

3. Hutton, Richard. The Cosmic Chase. New York: NAL/Mentor, 1981.

4. Powers, Robert M. Shuttle: The World's First Spaceship. Harrisburg, PA.: Stackpole Books, 1979.

5. The First 25 Years in Space: A Symposium. Ed. by Allan A. Needell. Smithsonian Institution, 1983.

6. Von Braun, Werner, and Frederick L. Ordway III. History of Rocketry and Space Travel. New York: Crowell, 3rd rev. ed., 1975.

RESOURCES

1. Aviation Week and Space Technology
   McGraw-Hill, Inc.,
   P.O. Box 430,
   Hightstown, N.J. 08520

2. NASA
   Goddard Space Flight Center,
   Attn: Teacher Resource Laboratory,
   Mail stop 130-3,
   Greenbelt, MD 20771

3. National Aeronautics and Space Administration
   NASA Facts, John F. Kennedy Space Center,
   Florida 32899

4. Space World, Palmer Publications, Inc.,
   National Space Institute,
   P.O. Box 7535,
   Ben Franklin Station
   Washington, D.C.

UNIT TITLE: HUMAN BEHAVIOR (VII)

BACKGROUND INFORMATION

The study of human behavior arouses a great deal of student interest and enthusiasm. This unit begins with an examination of the structure and function of the human nervous system. The students then explore the simple reflex or inborn behaviors of both animals and humans and test many of their own reflexes in laboratory experiments. These experiments lead to a study of the influence of learned behavior in the development of conditioned reflexes and habits. Next the students conduct a series of experiments associated with how we learn and methods to improve our memory for greater academic achievement. The unit concludes with a view of human sleep patterns, in which the reasons for sleep, the cycles of sleep and the consequences of sleep deprivation are explored.

OBJECTIVES

Students should be able to:

1- Identify the parts of the central nervous system and describe the function of each.

2- Name and describe the components of the peripheral and and autonomic nervous systems.

3- Describe how a simple reflex works.

4- Diagram a simple reflex arc.

5- Describe how animals and humans are conditioned.

6- Recognize the difference between good and bad habits.

7- Relate how habits can be useful.

8- Identify instinctive behaviors of animals.

9- Describe how trial and error learning occurs in humans.

10- Relate the difference in levels of intelligence between lower animals, primates and humans.

11- Describe the difference between short term and long term memory.

12- Describe how our retention and recall of information can be improved.

13- State early and modern theories of why we sleep.

14- Identify the stages and biological changes of sleep.

15- Relate the importance of the REM period to humans.

CONTENT OUTLINE

I. Nervous System
    A. The central nervous system (brain)
        1. Cerebrum
        2. Cerebellum
        3. Medulla oblongata
        4. Spinal cord
    B. The peripheral nervous system
        1. Cranial nerves
        2. Spinal nerves
    C. The autonomic nervous system
        1. Sympathetic division
        2. Parasympathetic division

II. Reflexes
    A. Simple reflex
        1. Define
        2. Reflex arc
        3. Examples of simple reflexes
    B. Conditioned reflex
        1. Define
        2. Examples of conditioned reflex
        3. Habits

III. Learning
    A. Process in lower animals
        1. Instinct
        2. Repetition
    B. Process in humans
        1. Trial and error
        2. Conditioning
        3. Problem solving
    C. Memory
        1. Function of brain
        2. Short/long term
        3. Methods to improve memory

IV. Sleep
    A. Theories on sleep
        1. Nerve cells shrink
        2. Toxins accumulate
        3. Diminished blood supply
        4. Hypothalamus
    B. Stages of sleep
        1. Early conditions
        2. Light sleep
        3. Deep sleep
    C. Biological changes
        1. Pulse rate
        2. Body temperature

3. Blood pressure
4. Breathing
5. Perspiration
6. REM period

ACTIVITIES

1- Students use a drawing of the central nervous system to label and write the main function of each part.

2- Students test simple reflexes such as knee jerk, blinking of eyes, jumping at sound of loud noise.

3- Have students list examples of how animals have been conditioned.

4- Students make a list of good and bad personal habits.

5- Conduct trial and error experiments using parallelogram and "T" puzzle.

6- Conduct memory experiment using sense and nonsense words.

7- Memory experiment using a picture to demonstrate importance of verbal and written clues to recall details.

8- Student written reports on sleep and dreams.

AUDIO-VISUAL AIDS

FILMS

1. Mysteries of the Mind
   National Geographic
   #51084 (videotape)

2. Do Animals Reason?
   National Geographic
   #51049 (videotape)

FILMSTRIPS

1. Introducing the Wonders of the Brain
   National Geographic Ed. Services,
   Washington, D.C. 20036
   #04520 (set).

2. Mysteries of the Brain
   National Geographic Ed. Services,
   Washington, D.C. 20036
   #04520 (set)

3. Your Body: Series III
   Educational Images Ltd.,
   Elmira, N.Y. 14905
   #FS1099

4. Nervous System: Structure and Function
   Ward's Natural Science Establishment, Inc.,
   5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, N.Y. 14692-9012

5. Understanding the Human Brain
   Ward's Natural Science Establishment, Inc.,
   5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, N.Y. 14692-9012
   (4 part series)

6. Brain Triggers: Biochemistry and Human Behavior
   Ward's Natural Science Establishment, Inc.,
   5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, N.Y. 14692-9012
   (3 part set)

7. Psychobiology: The Brain and Behavior
   Science and Mankind,
   Communications Park,
   P.O. Box 2000
   Mount Kisco, N.Y. 10549
   #1-1013-610 (set)

REFERENCES

1. Baddeley, Alan D. Your Memory: A User's Guide. MacMillan, 1982.

2. Higbee, Kenneth L. Your Memory: How It Works and How to Improve It. Prentice-Hall, 1977.

3. Justrow, Robert. The Enchanted Loom: Mind in the Universe. Simon & Schuster, 1981.

2. Mysteries of the Brain
   National Geographic Ed. Services,
   Washington, D.C. 20036
   #04520 (set)

3. Your Body: Series III
   Educational Images Ltd.,
   Elmira, N.Y. 14905
   #FS1099

4. Nervous System: Structure and Function
   Ward's Natural Science Establishment, Inc.,
   5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, N.Y. 14692-9012

5. Understanding the Human Brain
   Ward's Natural Science Establishment, Inc.,
   5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, N.Y. 14692-9012
   (4 part series)

6. Brain Triggers: Biochemistry and Human Behavior
   Ward's Natural Science Establishment, Inc.,
   5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, N.Y. 14692-9012
   (3 part set)

7. Psychobiology: The Brain and Behavior
   Science and Mankind,
   Communications Park,
   P.O. Box 2000
   Mount Kisco, N.Y. 10549
   #1-1013-610 (set)

REFERENCES

1. Baddeley, Alan D. Your Memory: A User's Guide. MacMillan, 1982.

2. Higbee, Kenneth L. Your Memory: How It Works and How to Improve It. Prentice-Hall, 1977.

3. Justrow, Robert. The Enchanted Loom: Mind in the Universe. Simon & Schuster, 1981.

4. Loftus, Elizabeth. Memory: Surprising New Insights Into How We Remember and Why We Forget. Addison-Wesley, 1980.

5. Regestein, Quentin R., and Jame R. Rechs. Sound Sleep: Key to a Healthier Life. New York: Simon & Schuster, 1980.

UNIT TITLE: AIR POLLUTION (VIII)

BACKGROUND INFORMATION:

The effects of air pollution take a devistating toll on the biotic and abiotic components of the environment. Even to the casual observer, these effects are most apparent. In this unit of study both natural and man made sources of pollution are identified. After a review of the components of each layer of the atmosphere, students are given the opportunity to recognize the need for control of air pollution. This area of study is intended to provide students with the information needed to evaluate the effectiveness of various pollution control measures and to debate the effectiveness of governmental initiatives in this critical area.

OBJECTIVES:

Students should be able to:

1- Relate weather patterns to distribution of air pollutants in the Earth's atmosphere.

2- Identify and describe the characteristics of the atmospheric zones.

3- List the gaseous components of the atmosphere.

4- Describe sources of air pollution from material sources.

5- Trace the steps of the carbon dioxide, nitrogen and oxygen cycles.

6- Describe man made sources of air pollution.

7- Interpret the effects of specific air contaminents on plants, animals, humans, and property.

8- Suggest methods to prevent air pollution.

9- Identify federal, state, and local government agents that deal with environmental control.

CONTENT OUTLINE

I. The Earth's Atmosphere
   - A. Major North American weather patterns
     1. Winter weather patterns
     2. Summer weather patterns
   - B. Atmospheric zones
     1. Troposphere
     2. Stratosphere
     3. Ionosphere
     4. Exosphere
   - C. Gaseous components
     1. Percent composition of component gases
     2. Importance of component gases

II. Natural Pollutants
   - A. Ash and gas from volcanic activity
   - B. Wind-blown dust
   - C. Smoke, ash, and gas from forest fires
   - D. Ocean salt spray
   - E. Pollen
   - F. Gas from natural decomposition

III. Man Made Pollutants
   - A. Burning fuels
   - B. Industrial
   - C. Automotive
   - D. Nuclear

IV. Cycles of Atmospheric Gases
   - A. Carbon cycle
   - B. Nitrogen cycle
   - C. Oxygen cycle

V. Examples of Atmospheric Pollutants
   - A. Carbon monoxide
   - B. Carbon dioxide
   - C. Sulfur dioxide
   - D. Hydrocarbons
   - E. Hydrogen fluoride
   - F. Hydrogen sulfide
   - G. Ozone
   - H. Nitrogen dioxide
   - I. Particulates

VI. The Effects of Air Pollution
   - A. Plants
   - B. Animals
   - C. Humans
   - D. Property

VII. Control of Air Pollutants
- A. Burning of low pollutant fuels
- B. Pollutant absorption devices.
- C. Pollutant recoverey devices
- D. Catalytic reduction

ACTIVITIES

1- Student reports on selected topics related to air pollution.

2- Students draw posters to depict effects of air pollution.

3- Students construct charts of the hydrologic cycle, carbon cycle, nitrogen cycle and oxygen cycle.

4- Students construct charts of atmospheric layers.

5- Students generate lists of ways to reduce air pollution.

6- Students photograph and/or report on various sources of air pollution in the community.

7- Conduct "Temperature Inversion" experiment as a lab or demonstration activity.

AUDIO-VISUAL AIDS

FILMS

1. The Poisoned Air, CF-619
   Association Instructional Materials,
   600 Madison Avenue, New York

2. The Myths and the Parallels, CB-100
   Association Instructional Materials,
   600 Madison Avenue, New York

3. Air is for Breathing,
   Shell Film Library,
   1433 Sadlier Cir. W. Dr.,
   Indianapolis, Indiana 46239

4. Air Pollution - The Facts,
   American Lung Association,
   1740 Broadway,
   New York, New York 10019

FILMSTRIPS

1. Challenges to a Healthy Environment,
   National Geographic Society,
   Educational Services, Dept. 87,
   Washington, D.C. 20036

2. Air Pollutants: An Introduction, EP-2162
   Educational Images Ltd.,
   P.O. Box 34565,
   West Side, Elmira, New York 14905

REFERENCES

1. Goldin, Agusta. Water: Too Much Too Little, Too Polluted? Harcourt, 1983.

2. Maugh, G.H. Studies Renew Anxiety About Fading Ozone. Los Angeles Times. Feb. 2, 1986. Page 1.

3. Mc Graw-Hill Encyclopedia of Environmental Science. New York: Mc Graw-Hill, 1980.

4. Samuels, Mike, and Bennett, Hal Z. Well Body, Well Earth: The Sierra Club Environmental Sourcebook. Sierra, 1983.

5. Sherman, Deborah A. Why We Still Can't Breathe Easy. USA Today. July, 1986. Pages 77-79.

RESOURCES

1. Agricultural Research Service, Information Division, Washington, D.C. 20402.

2. College of Agriculture and Environmental Science, Rutgers, The State University, New Brunswick, N.J.

3. United States Agricultural Research Center, Educational Services Branch, Beltsville, Md. 20705.

4. National Audubon Society, Educational Services Dept., 1130 Fifth Ave., New York, N.Y. 10028.

UNIT TITLE: WATER POLLUTION (IX)

BACKGROUND INFORMATION:

As with air pollution, students are keenly aware of the effects of water pollution. One such area of recent concern is acid rain. After an introduction to water cycle and an identification of bodies of water affected by pollution, this unit is introduced by emphasizing the importance of water to living things. A number of contaminents are identified and their effects on plants, animals, humans, and property are discussed. Control of water pollution is a focal point of this unit. Students are encouraged to assess the effectiveness of various control measures. A survey of magazine and newspapers provides a rich source of contemporary information about this topic.

OBJECTIVES

Students should be able to:

1- Identify industrial sources of water pollution.

2- Describe sources of natural water pollution.

3- Recognize samples of polluted water.

4- List pesticides which act as water pollutants.

5- Describe how sewage acts as a water pollutant.

6- Describe how detergents act as a water pollutant.

7- Describe how nuclear waste acts as a water pollutant.

8- Relate the effects of water pollution on plants, animals, humans and property.

9- Evaluate the effectiveness of water pollution controls.

10- Predict the long-term effects of acid rain.

CONTENT OUTLINE

I. The Earth's Hydrosphere
   - A. Major bodies of fresh water
   - B. Major oceans
   - C. Relation of water to life

II. Water Contaminents
   - A. Silt
   - B. Nutrient runoff (fertilizers)
   - C. Chemical wastes (industrial)
   - D. Oil spills
   - E. Thermal pollution
   - F. Sewage
   - G. Chemical wastes (residential)
   - H. Herbicides, pesticides
   - I. Nuclear waste
   - J. Acid rain

III. Effects of Water Pollution
   - A. Plants
   - B. Animals
   - C. Humans
   - D. Property

IV. Control of Water Pollution
   - A. Sewage treatment facilities
   - B. Regulation of landfill sites.
   - C. Cooling ponds and cooling towers
   - D. Restrictions on ocean dumping
   - E. Safeguards at offshore drilling sites
   - F. Recycling of biodegradable and non-biodegradable wastes

V. Acid Rain
   - A. Measurement of acidity
   - B. Definition of acid rain
   - C. Causes of acid rain
     1. Chemical pollutants
        - a. Nitrogen oxides
        - b. Sulfur oxides
     2. Sources
        - a. Combustion of oil
        - b. Combustion of coal
   - D. Environmental effects
     1. Aquatic ecosystems
        - a. Lakes and ponds
        - b. Fish
     2. Terrestrial ecosystems
        - a. Forest soils
        - b. Cultivated plants

ACTIVITIES

1- On a local or state map, students locate and identify bodies of water that are potential sites of water pollution.

2- Field trips to local streams and rivers to observe, collect, and identify samples of polluted water.

3- Field trip to sewage treatment facility.

4- Field trip to local water treatment plant.

5- Students complete chart of Earth's hydrologic cycle.

6- Students research and test the chemical and physical properties of various water pollutants.

7- Students report on solid waste management at local, county, and state level.

8- Students research the effects of offshore dumping on the coastal environment.

9- Students begin photography survey of the effects of of pollution on a local pond or lake.

AUDIO-VISUAL AIDS

FILMS

1. The Water Famine, CF-529
   Association Instructional Materials,
   600 Madison Avenue, New York. 10019

2. The Majestic, Polluted Hudson, BS-482
   Association Instructional Materials,
   600 Madison Avenue, New York. 10019

3. Space Research and your Home and Environment, HQ-321
   National Aeronautics and Space Administration,
   Goddard Space Flight Center, Public Affairs Office,
   Code 202, Greenbelt, Maryland. 20771

4. The River Must Live,
   Shell Film Library,
   1433 Sadlier Cir. W. Dr.,
   Indianapolis, Indiana. 46239

FILMSTRIPS

1. Water: A Precious Resource,
   National Geographic, Educational Services,
   Washington, D.C. 20036

2. The Water Cycle, (set #173)
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

3. Protecting Our Waters, EP-2112
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

4. Biological Studies of River Pollution, EP-2113
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

5. Acid Rain, EP-2010
   Educational Images Ltd.,
   P.O. Box 3456,
   West Side, Elmira, New York. 14905

6. Introduction to the Water Cycle, 78W0160
   Wards, 5100 West Henrietta Road,
   P.O. Box 92912,
   Rochester, New York. 14692-9012

7. Introduction to the Carbon Cycle, 78W0170
   Wards, (see above).

8. Introduction to the Nitrogen Cycle, 78W0180
   Wards, (see above).

REFERENCES

1. Boyle, R.H. and R.A. Boyle. Acid Rain. New York: Schocker Books, 1983.

2. Dubos, R.J. The Wooing of Earth. New York: Scribners, 1980.

3. Krochmal, A. and C. Krochmal. Acid Rain: The Controversy. Dayton, Ohio: Pamphlet Publications, 1982.

4. McGraw-Hill Encyclopedia of Environmental Science. New York: McGraw-Hill, 1980.

RESOURCES

1. Agricultural Research Service
   Information Division,
   Washington, D.C. 20402

2. College of Agriculture and Environmental Science
   Rutgers, The State University,
   New Brunswick, New Jersey.

3. New Jersey Public Interest Research Group
   84 Paterson Street,
   New Brunswick, New Jersey. 08901

4. Water Pollution Control Federation
   2626 Pennsylvania Avenue, N.W.,
   Washington, D.C. 20037

UNIT TITLE: NOISE POLLUTION (X)

BACKGROUND INFORMATION

Noise pollution can be a subjective area. This unnit attempts to identify noise pollution in terms of unwanted and unpleasant sound. After a presentation on the characteristics of sound waves, various sources of noise pollution are identified. Scientists and physicians have gathered extensive data that shows the effects of excessive noise are both physical and mental. Apart from its effect on health and hearing, noise masks sounds that people want to hear. This unit provides students with the opportunity to identify and investigate methods that can reduce noise pollution.

OBJECTIVES

Students should be able to:

1- Define sound.

2- Describe sound ranges.

3- Apply units of measurement of sound.

4- List sources of noise pollution.

5- State the effects of noise pollution on human health.

6- State methods that can be used to control and reduce noise levels.

CONTENT OUTLINE

I. The Science of Sound
    A. Definition of sound
    B. Range of sound
        1. Ultrasonic frequencies
        2. Audible frequencies
        3. Subsonic frequencies
    C. Measurement of sound
    D. Sources of sound

II. Effects of Noise Pollution
    A. Hearing loss
    B. Annoyance
    C. Mental effects
    D. Physical effects
    E. Property damage

III. Sound Control
    A. Soundproofing
    B. Reducing noise levels
    C. Noise pollution ordinances at state and local level.

ACTIVITIES

1- Tape record a variety of sounds that are then categorized as pollutants or non-pollutants.

2- Students investigate local community noise zoning.

3- Record and identify sources of noise pollution in the community.

4- Students construct a graph that compares decibel levels from various sources.

5- A decibel meter is used to determine noise levels at various locations in the schools.

AUDIO-VISUAL AIDS

FILMSTRIPS

1. Noise Pollution
   Fisher Scientific EMD,
   4901 W. LeMoyne Street,
   Chicago, Illinois 60651
   #S25328B

2. Pollution and Health
   Fisher Scientific
   4901 W. LeMoyne Street,
   Chicago, Illinois 60651
   #S25328B

3. The Individual's Role in Pollution Control
   Fisher Scientific
   4901 W. LeMoyne Street,
   Chicago, Illinois 60651
   #S25328B

REFERENCES

1. Bennett, William I., M.D. Noise Pollution: Irritant or Hazard? Harvard Medical School Health Letter, vol. 11, No. 8, June, 1986.

2. Dunkle, Terry. The Sound of Silence. Science 82, April, 1982.

3. Leepson, Marc. Noise Control. Editorial Research Reports, vol. 1, No. 7, February 22, 1980.

4. Taylor, Ronald A. What all that Noise Pollution is Doing to Our Lives. U.S. News & World Report, July 16, 1984.

RESOURCES

1. American Academy of Otolaryngology
   1101 Vermont Ave., N.W.
   Suite 302,
   Washington, D.C. 20005

2. Environmental Protection Agency
   401 M Street, S.W.
   Washington, D.C. 20460

3. Social Issues Resources Series, Inc.
   P.O. Box 2507,
   Boca Raton, Florida 33427

4. Vital Issues
   Center for Information on America,
   Washington, Connecticut 06793

UNIT TITLE: ENERGY RESOURCES (XI)

BACKGROUND INFORMATION

Awareness of the energy crisis is a critical component of the instructional program if students are to be prepared for the future. This unit investigates a number of alternate energy sources, the consequences of unrestricted use of fossil fuels, and the principles of nuclear power. Based on such information, this sequence of lessons attempts to prepare students to make decisions that will effect energy management on a personal, societal, and global level.

OBJECTIVES:

Students should be able to:

1- Discuss the relationship of energy consumption to a community's quality of life, economics, and future development.

2- Compare current rates of energy consumption to those of the past.

3- List a variety of alternate energy sources.

4- Describe the origin of fossil fuels.

5- Identify ways in which energy is consumed in the home.

6- Evaluate the environmental impact of various energy sources.

7- Explain the environmental impact of various energy sources.

8- Analyze the functioning of a nuclear power plant.

9- Evaluate the short and long-term effects of proposed solutions to the energy problem.

10- Develop a personal energy conservation plan.

CONTENT OUTLINE

I. Energy Demand
    A. Early rates of consumption
    B. Current rates of consumption
    C. Future rates of consumption

II. Energy Sources
    A. Types of energy sources
        1. Fossil Fuels
            a. Natural gas
            b. Coal
            c. Oil
        2. Nuclear Energy
            a. fission reactions
            b. fusion reactions
        3. Alternate Energy
            a. Hydroelectric
            b. Geothermal
            c. Solar
            d. Wind
            e. Ocean thermal gradients
            f. Tidal power
            g. Fuel cells
            h. Solid wastes
    B. Evaluation of energy sources
        1. Availability
        2. Cost effectiveness
        3. Environmental effects
        4. Safety

III. Energy Consumption
    A. Type of use
        1. Residential
            a. Heating
            b. Cooling
            c. Cooking
            d. Heating water
            e. Lighting
    B. Energy conservation plan for residential energy consumption

IV. Production of Electric Power
    A. Generating station powered by fossil fuels
        1. Effects on environment
        2. Cost effectiveness
        3. Safety
    B. Generating station powered by nuclear fuel
        1. Effects on environment
        2. Cost effectiveness
        3. Safety

ACTIVITIES

1- Field trip to power company facility such as the JCP&L Energy Spectrum and local substation.

2- Group research reports on energy resources.

3- Students construct charts to depict energy use.

4- Students conduct a home energy audit that lists energy uses and abuses in their home.

5- Students use library resources to investigate nuclear power plant generation of electricity.

6- Students complete charts depicting how oil and natural gas are located, refined, and used.

7- Guest speakers from public utility company.

AUDIO-VISUAL AIDS

FILMS

1. Backyard Alternative Energy
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

2. Coal: The Rock That Burns
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

3. Electricity and the Environment
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

4. Electricity: Instant Energy
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

5. Energy 2000
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

6. Energy Security: Why and Wherefores
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

7. Radiation...Naturally
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

8. Nuclear Energy: The Question Before Us
   Modern Mass Media,
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

9. Energy: The Fuels and Man
   National Geographic, Educational Services,
   Washington, D.C. 20036

10. Nuclear Energy: The Question Before Us
    National Geographic, Educational Services,
    Washington, D.C. 20036

REFERENCES

1. Douglas, J.H. The Future World of Energy. New York: Watts, 1984.

2. Gabel, M. Energy, Earth, and Everyone. New York: Doubleday, 1980

3. Hoyle, Fred, and Geoffrey Hoyle. Commonsense in Nuclear Energy. San Francisco: W.H. Freeman, 1980.

4. McPhillips, Martin, ed. The Solar Energy Almanac. New York: Facts on File, 1983.

RESOURCES

1. American Nuclear Society
   555 North Kensington Ave.,
   LaGrange Park, Illinois 60525

2. Electric Power Research Institute, Inc.
   Public Information Dept.,
   P.O. Box 10412,
   Palo Alto, California 94303

3. Modern Mass Media
   P.O. Box 950,
   71 Passaic Ave.,
   Chatham, N.J. 07928-0950

4. New Jersey Department of Energy
   101 Commerce St.,
   Newark, N.J. 07102

5. Public Service Electric & Gas Company
   P.O. Box 570,
   T10C,
   Newark, N.J. 07101

6. Shell Film Library
   1433 Sadlier Circle West Drive,
   Indianapolis, Indiana 46239

7. U.S. Department of Energy
   Educational Division,
   Office of Consumer Affairs,
   Washington, D.C. 20585

UNIT TITLE: METEOROLOGY (XII)

BACKGROUND INFORMATION:

Meteorology is a science of great practical importance and of interest to everyone because the weather has a significant affect on our daily lives. It affects the markets for numerous articles of commerce and industry. It governs the safety and efficiency of transportation and the yield and quality of crops.

This unit will provide a background for the study of meteorology through an examination of the parts and composition of our atmosphere and the forces which cause it to change daily. The students will study major U.S. storm systems, some of which may occur during the year thereby adding even more relevance to the science of meteorology. An examination of the instrumentation used to gather weather data and attempts at making forecasts will demonstrate to the students how difficult and inexact a science meteorology can be.

OBJECTIVES

Students should be able to:

1- Define the science of Meteorology.

2- List and describe the layers of the Earth's atmosphere.

3- Identify the gases of the atmosphere.

4- Identify the pattern of atmosphere circulation.

5- State the major elements which effect the weather.

6- Describe the effect of air masses, fronts and pressure systems on weather.

7- Describe the origin and effect of major storm systems.

8- State the techniques and instrumentation used to make weather forecasts.

CONTENT OUTLINE

I. Composition of the Atmosphere
    A. Atmospheric layers
        1. Troposphere
        2. Stratosphere
        3. Mesosphere
        4. Thermosphere
    B. Atmospheric gases
        1. Nitrogen
        2. Oxygen
        3. Ozone
        4. Helium
    C. Atmospheric circulation
        1. Trade winds
        2. Revailing westerlies
        3. Polar easterlies

II. Weather
    A. Elements of weather
        1. Temperature
        2. Air pressure
        3. Wind
        4. Moisture
    B. Factors effecting weather
        1. Air masses
        2. Fronts
        3. Pressure systems
    C. Weather systems
        1. Thunderstorms
        2. Winter storms
        3. Tornadoes
        4. Hurricanes
    D. Forecasting the weather
        1. Instrumentation
        2. Satellites
        3. Weather maps
        4. Meteorological predictions

ACTIVITIES

1- Students chart layers of the Earth's atmosphere.

2- Students write reports on composition of the atmosphere.

3- Students draw location and direction of Earth's atmospheric circulation on diagram of Earth.

4- Students draw major masses on map of U.S.

5- Students diagram fronts and pressure systems.

6- Students write reports describing the origin, characteristics and protective measures from major storms.

7- Students write reports on meteorological instruments.

8- Students use U.S. maps to chart weather patterns.

AUDIO-VISUAL AIDS

FILMS

1. The Climate Factor
   Modern Talking Picture Service,
   P.O. Box 950,
   71 N. Passaic Ave.,
   Chatham, N.J. 07928

2. Water: A Precious Resource
   National Geographic Educational Services,
   Washington, D.C. 20036

3. Weather Awareness and Survival
   Educational Images Ltd.,
   Elmira, N.Y. 14905

4. Weather: Come Rain, Come Shine
   National Geographic Ed. Services,
   Washington, D.C. 20036

FILMSTRIPS

1. Understanding Weather and Climate
   Science and Mankind,
   Communications Park,
   Box 2000
   Mount Kisco, N.Y. 10549

2. Forecasting the Weather
   National Geographic Ed. Services,
   Washington, D.C. 20036

3. The Earth's Climate
   National Geographic Ed. Services,
   Washington, D.C. 20036

REFERENCES

1. Battan, Louis J. Fundamentals of Meteorology.
   Prentice-Hall, 1979.

2. Cohen, Daniel. What's Happening to Our Weather?
   Evans, 1979.

3. Field, Frank, Phd. Dr. Frank Field's Weather Book.
   Putnam, 1981.

4. Hardy, Ralph, and others. The Weather Book. Little, Brown, 1982.

5. Schaefer, Vincent J., and Day, J.A. A Field Guide to the Atmosphere. Houghton, 1981.

RESOURCES

1. U.S. Weather Service, Suitland, MD.

PRE-POST TEST - CONTEMPORARY SCIENCE

PART I - MATCHING - Match the fields of science at the right with the description that best describes it at the left. Place the letter of the field of science before the number of the description on the **ANSWER SHEET.**

1. The branch of biology dealing with the process, activities, and phenomena of life and living organisms.
2. The science of super cold temperatures.
3. The branch of biology which studies plants.
4. The study of the stars and the universe.
5. The science which studies the atom and its energy.
6. The science which deals with the life of past geological periods.
7. The study of the earth's weather phenomena.
8. The science which studies the history of the earth as recorded in the rocks.
9. The science which examines the force produced by flowing electrons.
10. The pseudo science which examines the influences of the stars upon human affairs and foretells events on the earth.
11. The branch of science which examines hydrocarbons and their derivatives.
12. The study of animals.
13. The science which studies the action of forces on bodies.
14. The science which examines the phenomena of concsiousness and behavior.
15. The study of the ocean and its phenomena.
16. The science which examines heredity and variation among organisms.
17. The study of the relationship between organisms and their environment.
18. The study of minute or very small organisms inhabiting the earth.

A-Astronomy

B-Meteorology

C-Genetics

D-Chemistry

E-Botany

F-Zoology

G-Geology

H-Oceanography

I-Ecology

J-Physiology

K-Microbiology

L-Paleontology

M-Cryogenics

N-Atomic Physics

O-Astrology

P-Electronics

Q-Psychology

R-Mechanics

PART II - **MULTIPLE CHOICE:** Write the letter of the word or words which best complete the following statements on the **ANSWER SHEET.**

19. If the world population continues at its present rate of growth, how long will it take to double? (a) 10 years or less (b) approx. 20 years (c) approx. 35 years (d) approx. 95 years.

20. Air enters the lungs through the bronchi which branch many times into smaller and smaller tubes which eventually end in groups of tiny air sacs called: (a) pleura (b) alveoli (c) trachea.

21. Stimulants are a variety of substances, both natural and synthetic, which stimulate the central nervous system. All the following are stimulants **EXCEPT:** (a) amphetamines (b) cocaine (c) heroin (d) crack.

22. All planets of the solar system: (a) have the same gravity (b) have the same size (c) have satellites (d) revolve about the sun.

23. Two forces which a rocket must overcome in order to achieve an orbit in space are friction and: (a) rotation (b) acceleration (c) gravity (d) weightlessness.

24. Atomic, Hydrogen and Neutron weapons all release large amounts of energy. This energy is called: (a) TNT (b) nuclear (c) conventional (d) incendiary.

25. Three dangerous storms which cause natural disasters are blizzards, hurricanes, and tornadoes. These storms are caused by weather systems called: (a) highs (b) lows (c) fronts (d) jet streams.

26. In acquiring good habits and in learning, in general, there are several things which appear to make learning more efficient and meaningful. One such condition is: (a) telling a person he must learn something (b) rewarding or punishing the person (c) making the person learn through trial and error (d) none of the above.

27. Opponents of nuclear power have often stated, "Nuclear power plants are dangerous and can explode like a nuclear bomb." (a) true (b) false.

28. The harmful gases in our air, known as air pollutants, are concentrated in the region of the atmosphere known as the: (a) Ionosphere (b) Troposphere (c) Exosphere (d) Stratosphere.

29. The sewage treatment process which removes the highest percentage of waste and contributes the least amount of water pollution is called: (a) tertiary (b) primary (c) secondary (d) distillation.

30. Each day some 16 million people are exposed to on-the-job noise levels that could permanently damage their hearing according to the Department of Environmental Protection. The decibel level that would first produce harmful affects would be: (a) 50-70 (b) 70-90 (c) 90-110 (d) 110-130

31. Three-fourths of the over-all energy needs of the United States is provided by: (a) atomic power (b) hydroelectric power (c) petroleum (d) solar power.

32. Which of the following population determiners tend to add to the number of individuals in a given population? (a) natality and mortality (b) mortality and immigration (c) emigration and natality (d) natality and immigration.

33. The process by which air is taken into the lungs and also removed from the lungs is called: (a) expiration (b) respiration (c) metabolism (d) inspiration.

34. Depressants are a variety of substances, both natural and synthetic, which act as sedatives and slow down the central nervous system. All the following are depressants **EXCEPT:** (a) opium (b) morphine (c) LSD (d) barbiturates.

35. In order for man to live in space or on another planet he would have to be provided with warmth, food, water and: (a) oxygen (b) carbon dioxide (c) carbon monoxide (d) hydrogen.

36. A satellite which remains stationary over a particular region of the earth is said to have a: (a) elliptical (b) oval (c) perigee (d) synchronous orbit.

37. The union of H atoms to release energy is called thermonuclear: (a) fusion (b) fission (c) radiation (d) propulsion.

38. Our atmosphere contains many different gases and in varying amounts. The gas which composes the major percentage of our air is: (a) Oxygen (b) Hydrogen (c) Carbon Dioxide (d) Nitrogen.

39. Man learns most if not all his behaviors. In man the simplest type of response to a stimulus is: (a) conditioned reflex (b) voluntary reaction (c) simple reflex (d) intuition.

40. The purpose of burning coal, oil or natural gas in a fossil fuel plant is to produce: (a) light (b) electricity (c) petro chemicals (d) gasoline.

41. The harmful air pollutant produced from burning petroleum is: (a) nitrogen (b) carbon monoxide (c) sulfur dioxide (d) water vapor.

42. The source of water for the earth's hydrologic cycle is: (a) the polar ice (b) the ocean (c) the rivers and streams (d) the lakes and ponds.

43. Scientists have found that sound is transmitted fastest in which of the following states of matter? (a) solid (b) liquid (c) gas (d) plasma.

44. The source of energy which the United States relies on most is: (a) nuclear (b) fossil fuel (c) hydroelectric (d) solar.

45. Which of the following situations must occur in order for a population to achieve ZPG? (a) immigration must be reduced (b) infant natality must be increased (c) natality must equal mortality (d) mortality must be reduced.

46. The passage of air into and out of the body is controlled by the: (a) lungs (b) medulla (c) cortex (d) cerebrum.

47. Drugs which both stimulate and/or depress the central nervous system and produce bizarre mental effects, personality changes and "flashbacks" are called: (a) narcotics (b) hypnotics (c) deliriants (d) hallucinogens.

48. Distances in space are so great that scientists measure them in units called: (a) light years (b) kilometers (c) miles (d) milliseconds.

49. The NASA space program which sent men to the moon was the: (a) Mercury (b) Apollo (c) Gemini (d) Skylab Program.

50. The three main particles composing an atom are neutrons, electrons, and: (a) nuclei (b) ions (c) protons (d) molecules.

51. The type of weather which will occur on the earth can be accurately predicted about three days in advance by satellite photos and barometric pressure changes. A falling barometer is produced by what type of weather system? (a) low (b) high (c) cyclonic (d) fair.

52. We perform many of our daily activities without much conscious effort. That is, many of the things we do such as walking, writing, and talking are automatic. These reactions which require little or no thought are called: (a) automatic skills (b) acquired actions (c) habits (d) instinct.

53. Electricity is generated by using: (a) uranium (b) natural gas (c) oil (d) all of these.

54. The single greatest source of air pollution is: (a) industry (b) open burning (c) volcanic eruptions (d) the automobile.

55. Algal blooms or "red tides" are indications of polluted water. These pollution conditions are due to build up of: (a) CO2 (b) O2 (c) phosphates (d) mercury, in the water.

56. The loss of hearing in humans, from excessive loud noise, is due to damage to the: (a) pinna (b) ossicles (c) cochlea (d) tympanic membrane.

57. In the years ahead, what kind of energy system is our country likely to have? (a) all-solar (b) all-electric (c) all-gas (d) none of the above.

58. All populations tend to increase in which of the following ways: (a) arithmatically (b) geometrically (c) graduallly (d) demographically.

59. A serious disease caused by excessive cigarette smoking which results in shortness of breath is: (a) asthma (b) bronchitis (c) emphyzema (d) pneumonia.

60. The scientific study of the history and sources of drugs, their physical and chemical properties and mechanisms of action, their absorption, distribution and transformation within the body and their use in the treatment of illness is called: (a) pharmacology (b) toxicology (c) pathology (d) psychology.

61. Stars produce their energy by the process known as thermonuclear fusion. The heat and light produced is the result of the fusion of atoms of: (a) oxygen (b) helium (c) hydrogen (d) carbon.

62. Stars vary in size and color throughout the universe. Stars which are the hottest have what color? (a) white (b) blue white (c) yellow (d) red.

63. The most important future space program which will provide valuable benefits to mankind is the: (a) Skylab (b) Space Shuttle (c) Explorer (d) Mariner Program.

64. An atomic explosion produces three destructive effects; blast, heat, and: (a) fire (b) wind (c) tornadoes (d) radiation.

65. The major portion of the Earth's atmosphere is found within how many miles of the surface? (a) 100 miles (b) 5 miles (c) 10 miles (d) 20 miles.

66. Certain organisms respond in more or less the same way to any given stimulus or are capable of performing acts without having learned how to perform such acts. These kinds of behaviors are called: (a) conditioned (b) habits (c) instinctive (d) acquired.

67. Electrical energy is due to th flow of: (a) protons (b) neutrons (c) electrons (d) none of these.

68. Dangerous air pollution conditions occur during inversions. This weather condition most frequently occurs during: (a) summer (b) autumn (c) winter (d) spring.

69. The major source of food for marine organisms is: (a) kelp (b) fish (c) plankton (d) salt.

70. Which of the following would produce the greatest decibel level? (a) heavy traffic (b) jet plane takeoff (c) jackhammer (d) power mower.

71. The United States accounts for approximately 6% of the world's population and consumes which percent of the world's energy resources? (a) 10% (b) 30% (c) 50% (d) 70%.

72. When studying natural populations, ecologists examine biological limiting factors which influence the number of members of a particular species at a given time. Which of the following are limiting factors? (a) predation (b) intraspecific competition (c) environmental conditions (d) all of these.

73. A person's lung capacity or volume of air contained in the lungs is measured with a: (a) stethescope (b) spirometer (c) manometer (d) lungometer.

74. Many of the drugs discussed in class deal with both physical and psychological addiction. Which of the following drugs listed below poses the greatest harm to the body when attempting to stop the addiction cycle? (a) barbiturates (b) amphetamines (c) narcotics (d) hallucinogens.

75. Gigantic eruptions on the sun which cause radio interference and changes in the Earth's weather are called: (a) prominences (b) sunspots (c) solar flares (d) novas.

76. The scientist who stated that for every action there is an equal and opposite reaction was: (a) Von Braun (b) Einstein (c) Fermi (d) Newton.

77. If you had a choice of time over which to receive an exposure dose of 100 roentgens, which would you choose? (a) 5 days (b) 5 hours (c) 5 weeks (d) 5 months.

78. The weather system which covers the largest geographical area and causes the greatest amount of damage is a: (a) tornado (b) hurricane (c) cyclone (d) blizzard.

79. The outer layer of the cerebrum is the cortex, in which most of the "gray matter" of the brain is located. This cortex enables man to: (a) respond automatically to various stimuli (b) breathe and carry on involuntary reactions (c) think, reason, and make judgements (d) regulate the heart rate.

80. When loops of wire are moved over a magnet so that the loops cut across the magnetic lines of force: (a) the magnet loses its magnetic properties (b) the wire becomes a magnet (c) electricity moves in the magnet (d) electricity moves in the wire.

81. A very serious air pollution condition known as smog occurs in areas which are heavily populated and highly industrialized. This condition is due to the reaction of chemical pollutants in the air with: (a) sunlight (b) water (c) oxygen (d) clouds.

82. A very important indicator of water pollution is the presence of coliform bacteria. Environmentalists know when these bacteria are present the water contains: (a) phosphates (b) sewage (c) oil (d) nuclear wastes.

83. People subjected to excessive noise over long periods of time may suffer from: (a) cardiovascular disorder (b) auditory disorder (c) neurological disorder (d) all of these.

84. The most abundant resource in the United States is: (a) coal (b) electricity (c) natural gas (d) oil.

85. The disease contracted by coal miners inhaling large amounts of carbon dust is called: (a) TB (b) smog (c) bronchitis (d) black lung.

86. Only one side of the moon is ever seen from the earth because: (a) only one side reflects light (b) the moon does not rotate (c) the moon's period of rotation is equal to its period of revolution (d) the moon is at perigee.

87. The nuclear weapon effect that has the potential for affecting the largest geographical area is: (a) fallout (b) thermal (c) blast (d) gamma rays.

88. A scientist observing a patient's REM period is studying the person's: (a) eye disease (b) dream period (c) blood pressure (d) respiratory rate.

89. Which of the following chemicals is **NOT** a dangerous air pollutant? (a) N (b) SO2 (c) NO (d) O3.

90. The principle energy source of the atomic bomb is: (a) H (b) TNT (c) U235 (d) PCB.

91. The drug present in cigarette smoke which causes a person to become dependent on smoking is: (a) tar (b) carbon monoxide (c) nicotine (d) morphine.

92. Radiation sickness is: (a) contagious for children only (b) harmful to old people only (c) not contagious (d) caused by bacteria.

93. An air pollution device used to remove particles from industrial furnaces to prevent their release in our atmosphere is the: (a) cyclotion (b) scintillation counter (c) electrostatic precipitator (d) tokamak.

94. As the result of the deposition of large amounts of chemicals and wastes into our waters, the natural process of aging has been increased. The accelerated aging of bodies of water is called: (a) biogenesis (b) diastrophism (c) biodegradation (d) eutrophication.

95. Three protective factors available for protection from radiation are time, distance and: (a) space (b) shielding (c) dosimeters (d) geiger counters.

96. Half of the world's seafood comes from one tenth of 1% of the total area of the sea, chiefly the coastal regions most vulnerable to pollution. The coastal areas where 60% of all commercial fish species spend part of their lives are called: (a) swamps (b) bogs (c) estuaries (d) tidal pools.

97. The most dangerous form of radiation is a (an): (a) alpha particle (b) beta particle (c) gamma ray (d) x-ray.

98. A major source of phosphate in our local water is: (a) pesticides (b) herbicides (c) outboard motors (d) detergents.

99. A different form of the same element due to the addition or removal of neutrons is called a (an): (a) compound (b) mutant (c) isotope (d) roentgen.

100. An important chemical present in detergents which soften the wash water, increase the efficiency of the surface active agent, emulsify oil and greasy soils, and prevent dirt particles from redepositing on fabrics by suspending them in solution is: (a) nitrate (b) carbonate (c) chlorate (d) phosphate.

TOWNSHIP OF OCEAN SCHOOL DISTRICT

ACTION PLAN OBJECTIVE NUMBER FIVE:
CONTEMPORARY SCIENCE PROGRAM

STUDENT EVALUATION

Dear Student:

This is your opportunity to help your teacher in evaluating the Contemporary Science Program and to assist your school in determining the value of the program for future students.

The evaluation has three parts. The first part is a survey of your attitude toward the science areas examined in the program; the second part is your evaluation of the overall program; and the third part asks for your comments about various aspects of the program.

NAME _____ DATE _____

TEACHER _____ PERIOD _____

INSTRUCTIONS FOR THE ATTITUDE SURVEY SCALE

Read each statement and make sure you understand it. Then decide whether you agree or disagree with the statement and whether your agreement (or disagreement is strong or moderate.) Then circle the number which indicates your position on the statement:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Note that the higher numbers (4 and 5) mean agreement, that the middle number means that you are undecided, and that the lower numbers (1 and 2) mean disagreement.

Don't skip any items. If you're not sure how you feel about a statement, make the best decision you can.

Please respond to every statement. Thank you for taking the time to fill this survey out thoughtfully.

"PART A." CONTEMPORARY SCIENCE

STUDENT ATTITUDE SURVEY OF SCIENCE ISSUES

		SD	D	N	A	SA
1.	The skills and techniques developed for the space program are being applied in thousands of ways to other aspects of human life.	1	2	3	4	5
2.	Unmanned space probes provide valuable information about the earth, sun, planets and the universe.	1	2	3	4	5
3.	Taxpayer money spent on space research could be put to better use here on earth and should be sharply reduced.	1	2	3	4	5
4.	In my future I would like to use the science I learned in schools.	1	2	3	4	5

		SD	D	N	A	SA
5.	In the future most jobs will require a knowledge of science.	1	2	3	4	5
6.	Having a knowledge of science principles and methods will assist me in getting a job.	1	2	3	4	5
7.	Most of our air pollution and water pollution problems are caused by our use of energy.	1	2	3	4	5
8.	Science has enabled us to save the environment.	1	2	3	4	5
9.	My efforts will have a great effect on the amount of pollution.	1	2	3	4	5
10.	Science and technology are not the cause of many of the world's problems.	1	2	3	4	5
11.	People who understand science and technology are better off in our society.	1	2	3	4	5
12.	Citizens should have some control over use of scientific and technological advances.	1	2	3	4	5
13.	In modern times, decisions made by a few people in one place can have serious effects for the rest of the world.	1	2	3	4	5
14.	Scientific and technological research will help to make the world a better place in the future.	1	2	3	4	5
15.	We need to start planning now for the year 2500.	1	2	3	4	5
16.	Nuclear fission and fusion are readily available and will be able to produce all the electrical energy we'll need in the future.	1	2	3	4	5
17.	Fossil fuel power plants are the most efficient and economical source for producing electricity.	1	2	3	4	5

	SD	D	N	A	SA
18. Electricity is the cleanest and cheapest form of energy.	1	2	3	4	5
19. The Earth has an infinite supply of fossil fuels.	1	2	3	4	5
20. The United States consumes the greatest proportion of the world's available energy.	1	2	3	4	5
21. The development of nuclear energy is the cleanest and safest way to produce unlimited supplied of energy.	1	2	3	4	5
22. Other species have died out and mankind could die out too!	1	2	3	4	5
23. There is a delicate balance in nature which people should not disturb.	1	2	3	4	5
24. Some aspects of nature are impressive and essential to survival, but things like mosses and plankton are unimportant.	1	2	3	4	5
25. Scientists and legislators working together will be able to substantially reduce pollution, but only if they are pressured to do so.	1	2	3	4	5
26. The government should spend more money on scientific research.	1	2	3	4	5
27. Politicians frequently vote for laws that benefit large businesses rather than the people who elect them.	1	2	3	4	5
28. In terms of available resources, the Earth may soon be overpopulated.	1	2	3	4	5
29. If we defend the freedom to have as many children as we want, we may lose all other freedoms as a result of overcrowding.	1	2	3	4	5

	SD	D	N	A	SA
30. Countries throughout the world should develop economic and social incentives to encourage people to have smaller families.	1	2	3	4	5
31. Astronomy is a very important field of science.	1	2	3	4	5
32. Research studies of our sun have provided very valuable information for use on the earth.	1	2	3	4	5
33. Astronomers should continue to search for extraterrestrial life.	1	2	3	4	5
34. A person can easily become psychologically addicted to cocaine as well as to heroin, alcohol, and many other drugs.	1	2	3	4	5
35. The use of drugs by young people experiencing personal, social, family and school problems has serious consequences in that they prevent youngsters from learning how to solve their problems.	1	2	3	4	5
36. If you decide to start using drugs, the possible addiction - whether physical or psychological, may be the last really free decision you make for a long time.	1	2	3	4	5
37. Cigarette advertising should not be banned, even if smoking is dangerous to health.	1	2	3	4	5
38. Since cigarette smoking is a personal choice, smokers should be allowed to smoke whenever and wherever they choose.	1	2	3	4	5
39. Cigarette smoking and the chewing of smokeless tobacco are expensive habits which can cause very serious health problems.	1	2	3	4	5

	SD	D	N	A	SA
40. Local, state and national civil defense programs are essential in preventing loss of life and property from natural disasters.	1	2	3	4	5
41. A civil defense system would ensure survival in the event of nuclear war.	1	2	3	4	5
42. Nuclear weapons are far more destructive than conventional weapons.	1	2	3	4	5
43. Nuclear radiation is used in many areas of society and is very beneficial to mankind.	1	2	3	4	5
44. Humans can survive an all out nuclear war.	1	2	3	4	5
45. Meteorology is a very interesting field of science.	1	2	3	4	5
46. Meteorologists can accurately predict weather patterns one week in advance.	1	2	3	4	5
47. The weather has an important influence on our daily lives.	1	2	3	4	5
48. Psychologists have developed methods to improve our ability to remember information.	1	2	3	4	5
49. Research has shown that dreams play a very vital part in your life.	1	2	3	4	5
50. Adequate sleep is important for your physical and mental well being.	1	2	3	4	5

NAME _____ DATE _____

TEACHER _____ PERIOD _____

INSTRUCTIONS FOR THE ATTITUDE SURVEY SCALE

Read each statement and make sure you understand it. Then decide whether you agree or disagree with the statement and whether your agreement (or disagreement is strong or moderate.) Then circle the number which indicates your position on the statement:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Note that the higher numbers (4 and 5) mean agreement, that the middle number means that you are undecided, and that the lower numbers (1 and 2) mean disagreement.

Don't skip any items. If you're not sure how you feel about a statement, make the best decision you can.

Please respond to every statement. Thank you for taking the time to fill this survey our thoughtfully.

"PART B" CONTEMPORARY SCIENCE

STUDENT ATTITUDE SURVEY OF COURSE

		SD	D	N	A	SA
1.	The written assignments were directly related to the science topics or units studied.	1	2	3	4	5
2.	My ability to use the library for research material has improved.	1	2	3	4	5
3.	My ability to express scientific material in writing has been strengthened.	1	2	3	4	5
4.	The research reports were valuable in relation to the course objectives.	1	2	3	4	5
5.	The videotapes/films were interesting and stimulating.	1	2	3	4	5
6.	The slide presentations were interesting and stimulating.	1	2	3	4	5

		SD	D	N	A	SA
7.	The teacher's supplementary handout materials were valuable as learning aids.	1	2	3	4	5
8.	The tapes, films and visual materials were relevant to the course objectives.	1	2	3	4	5
9.	I became interested in watching science specials on television as a result of this course.	1	2	3	4	5
10.	Other members of my family became interested in watching science specials on television.	1	2	3	4	5
11.	The level of difficulty of the course was appropriate for me.	1	2	3	4	5
12.	The course was appropriate for my background (experience).	1	2	3	4	5
13.	The level of the course (sophistication of topics and/or methods) was appropriate for me.	1	2	3	4	5
14.	Other students were more advanced, so I had trouble keeping up.	1	2	3	4	5.
15.	The course was worthwhile in terms of obtaining knowledge of how science influences my life.	1	2	3	4	5
16.	The science areas and issues studied in this class are more important than grades.	1	2	3	4	5
17.	Students were interested and involved with class activities.	1	2	3	4	5
18.	The students' major job was to make judgements about the values of issues and ideas.	1	2	3	4	5
19.	In this class we learned things that were worth the time and effort.	1	2	3	4	5
20.	What I have learned in this class will help me become a more effective citizen.	1	2	3	4	5

		SD	D	N	A	SA
21.	I have learned to think through answers to questions rather than just memorize without understanding.	1	2	3	4	5
22.	This course helped me understand the importance of and need for scientific research.	1	2	3	4	5
23.	This course increased my interest in science.	1	2	3	4	5
24.	I learned to value new viewpoints because of this course.	1	2	3	4	5
25.	I was stimulated to discuss science topics with friends and family members outside of class.	1	2	3	4	5
26.	I felt this course had value for me as a person.	1	2	3	4	5
27.	I feel that all students would benefit from taking this course.	1	2	3	4	5
28.	I would recommend this course to other students.	1	2	3	4	5

"PART C" STUDENT COMMENTS

Answer the following questions carefully and completely. If you need additional space in which to write your answers, please use the reverse side of the questionnaire.

1. List the three (3) best things about this class from your point of view.

2. If you could change three (3) things about the class, what would they be?

3. Did this course help show you how science is related to other subjects? ___ yes ___ no
(Explain your answer)

4. Did this course help you to develop skills for critical thinking and decision making? ___ yes ___ no?
Can you give a specific example of how this course made you think?

5. Is there any knowledge that you obtained from this course that you can apply in your daily living? (Things or topics that directly or indirectly affect you or your family?) Please explain.

6. Have you ever discussed any of the things we talked about with your parents? ___ yes ___ no
What seemed to interest them the most?

TOWNSHIP OF OCEAN SCHOOL DISTRICT
CONTEMPORARY SCIENCE PROGRAM

Dear Parent:

During this past school year your son/daughter has been enrolled in our Contemporary Science Program. In order to continually improve the quality of this educational program we are asking for your input as part of the yearly evaluation.

Kindly respond to the following questions as fully as possible.

1. Have you or any member of your family discussed any of the science topics studied in the Contemporary Science Program? ___ yes ___no
   If yes, which topic(s).

2. Have you or any member of your family watched telivised science programs with your son/daughter?
   ___ yes ___ no
   If possible, identify the program or topic observed.

3. Did you learn any new science information as a result of your son/daughter being in the Contemporary Science Program? ___ yes ___ no
   Please give an example.

4. Did your son/daughter show increased interest in science due to enrollment in the Contemporary Science Program? ___ yes ___ no
In what way was interest increased?

5. Do you feel the Contemporary Science Program was beneficial for your son/daughter? ___ yes ___ no
In what way?

6. Additional Comments:

Thank you for your assistance in evaluating the Contemporary Science Program.

EVALUATION GUIDELINES

PRE-POST TEST - CONTEMPORARY SCIENCE

The questions on the course pre-post test are grouped into unit areas to ascertain the level of comprehension for each area studied. The following list indicates the respective areas examined and the questions which relate to each.

Content Area	Related Questions
Air Pollution	28, 41, 54, 68, 81, 89, 93
Astronomy	22, 35, 48, 61, 62, 75, 86
Drugs	21, 34, 47, 60, 74
Electricity	27, 40, 53, 67, 80
Energy Resoures	31, 44, 57, 71, 84
Human Behavior	26, 39, 52, 66, 79, 88
Noise Pollution	30, 43, 56, 70, 83
Nuclear Energy	24, 37, 50, 64, 77, 87, 90, 92, 95, 97, 99
Population	19, 32, 45, 58, 72
Smoking	20, 33, 46, 59, 73, 85, 91
Space Program	23, 36, 49, 63, 76
Water Pollution	29, 42, 55, 69, 82, 94, 96, 98, 100
Weather	25, 38, 51, 65, 78

EVALUATION OF COURSE ISSUES (Part A)

This segment of the student evaluation questions the student attitudes toward the major issues presented throughout the Contemporary Science course. Listed below are the areas examined and the questions related to each.

Content Area	Related Questions
Space Program	1, 2, 3
Careers	4, 5, 6
Pollution	7, 8, 9
Technology	10, 11, 12
Man's Future	13, 14, 15
Electricity	16, 17, 18
Energy Resources	19, 20, 21
Ecology	22, 23, 24
Politics, Bus., Govt.	25, 26, 27
Population	28, 29, 30
Astronomy	31, 32, 33
Drugs	34, 35, 36
Smoking	37, 38, 39
Civil Defense	40, 41
Nuclear Technology	42, 43, 44
Meteorology	45, 46, 47
Human Behavior	48, 49, 50

EVALUATION OF COURSE (Part B)

The course attitude survey attempts to evaluate the various materials, techniques and outcomes of the program as perceived by the students. Listed below are the areas evaluated and the questions related to each.

Area of Evaluation	Related Questions
Course Written Work----------	1-4
Course Audio Visual Materials------	5-10
Course Level----------	11-14
Course Value to Student----------	15-28

CONTEMPORARY SCIENCE
PRE/POST TEST KEY

1. J	26. B	51. A	76. D
2. M	27. B	52. A	77. D
3. E	28. B	53. D	78. B
4. A	29. A	54. D	79. C
5. N	30. B	55. C	80. D
6. L	31. C	56. C	81. A
7. B	32. D	57. D	82. B
8. G	33. B	58. B	83. D
9. P	34. C	59. C	84. A
10. O	35. A	60. A	85. D
11. D	36. D	61. C	86. C
12. F	37. A	62. B	87. A
13. R	38. D	63. B	88. B
14. Q	39. C	64. D	89. A
15. H	40. B	65. B	90. C
16. C	41. C	66. C	91. C
17. I	42. B	67. C	92. C
18. K	43. A	68. B	93. C
19. C	44. B	69. C	94. D
20. B	45. C	70. B	95. B
21. C	46. B	71. C	96. C
22. D	47. D	72. D	97. C
23. C	48. A	73. B	98. D
24. B	49. B	74. D	99. C
25. B	50. C	75. C	100. D